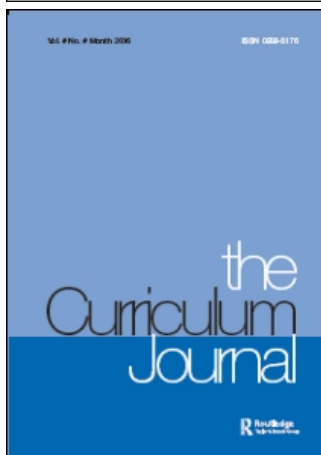


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Learning how to learn: the dynamic assessment of learning power

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This article introduces the notion of the assessment of ‘learning power’ as an important station in a mentored learning journey, which begins with the motivation and identity of the person who is learning, and moves through the awareness and development of the power to learn, to the publicly valued competencies and funds of knowledge of the formal curriculum. The seven dimensions of learning power are described, and the article reports on the findings of a qualitative study in which sixteen teachers were provided with learning power assessment data for their students as individuals and as whole groups. There were ten pedagogical themes which underpinned the teaching and learning encounters in those classrooms; these are briefly described. Learning power profiles have been used with nearly nine thousand students since 2003 and data from school-based development projects are referred to. The article concludes that the dynamic assessment of learning power serves three pedagogical purposes. First, it reflects back to the learner what they say about themselves in relation to their personal power to learn. Second, it reflects back to the teacher data about individuals, and groups, which can be used for diagnosing what is needed to move forward in the development of self-awareness, ownership and responsibility for learning. Third, it provides scaffolding for ways in which the students encountered the formal content of the curriculum. All of these operate together through the shared, and sometimes locally created, language stimulated by the learning dimensions, and through metaphors, icons and heroes which carry meaning in the classroom.

Keywords: *Assessment; Competencies; Language; Learning dispositions; Learning power; Pedagogy*

Introduction

The paradigmatic shift in the relationship of human beings to things and to bodily life on this planet characteristic of the information age creates a contextual challenge for learning how to learn. Knowledge and its manifestations are no longer ‘out there’, to be acquired from a centre, mastered and applied. Rather, the new technologies, having digitized and virtually automatized the collection, storage and manipulation of

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data, make it instantly and widely available through networked access for all. This has challenged the boundaries between science and morality, nature and culture, memory and consciousness, duty and right (Haraway, 1991; Jaros & Deakin Crick, 2006). Learning has now to concern itself with purpose and meaning, relate to a context, and include 'know-how' and 'know-why', not just 'know-what'. The *person* of the learner, knowing 'who I am, where I am coming from, where I am heading and why?' is integral to the context and purpose of learning. The key skills needed are the speedy and confident handling of technically and culturally changing and overflowing data and its reformulation to meet new and specific demands of the networked society. Equally important as these skills are the attitudes, dispositions, values and beliefs of the learner and, significantly, the learner's capacity for self-awareness and for taking responsibility for him or herself as a learner. The concept of learning power and learning how to learn must be understood and contextualized as part of a complex system in which the formation of a learning identity, personal power to learn and competencies for managing life in the post-mechanical age are as important as the acquisition of knowledge. This raises important questions about learning how to learn and the 'digital divide'—the gap between those who are able to benefit from digital technology and those who are not. Does developing learning to learn skills privilege some and not others, and what is the nature of the journey between the personal and the public?

Assessment practices

The practice that most determines what actually goes on in learning and teaching and in the school curriculum as a whole is assessment (Broadfoot, 1998). Assessment practices are embedded within particular discourses and narratives that substantially shape the experiences of learners and their teachers. Despite a now widely recognized need for schools to focus on personalization and learning how to learn, they are still dominated by discourse and practices of assessment and testing that focus on the summative assessment of learning outcomes, in support of the drive to raise standards of attainment, rather than formative assessment practices that support and strengthen students as learners. The Assessment Reform Group claims that these two themes are not mutually exclusive. The notion of raising standards *and* focusing on learning itself are not two separate practices but are actually powerfully informed by each other:

assessment which is explicitly designed to promote learning is the single most powerful tool we have for both raising standards and empowering lifelong learners. (Assessment Reform Group, 1999)

This shift in the focus and practice of educational assessment is, in its own way, revolutionary. It is based on the assumption that we need to develop new assessment *technologies*, without which the aspirations for personalized learning are unlikely to succeed. Just as the development of formal academic examinations laid the foundation for the educational arrangements of the twentieth century, so a new set

of assessment arrangements is needed to provide the foundation for the lifelong learning arrangements of the twenty-first century. As Shepard (2000) suggests, such a change may represent a significant paradigm shift in education.

This paradigm shift is towards a relational and transformative model of learning, in which the creation of interdependent communities of intentional learners provides a basis for the integration of 'traditional academic' skills and outcomes with the learning dispositions, values and attitudes necessary to meet the demands of the emerging 'networked society'. There is an urgent need for our education system to foster flexible, creative, self-aware and dynamic learners who have the capacity to apply and adapt what is learned to their own lives, embedded in their local and global communities, and who can extend their learning and understanding into spheres of thought and action which demand intelligent behaviour in the real world.

It is to help meet this need that the Effective Lifelong Learning Inventory (ELLI) was designed. The development of the learning power profiles and the assessment strategies which have emerged from their application reflect this emerging paradigm. Raising standards of attainment is important, but it is only one side of the coin: we need to pay equal attention to assessment practices which nurture the learning self, the personal power to learn as well as the skills and competencies of learning how to learn and the development of intentional, lifelong learners.

Learning how to learn: the terrain

Central to any notion of learning how to learn is the idea that the learners themselves need to want to learn, to become aware of themselves as learners and to be able to take responsibility for their own learning trajectories whether in or out of school and over a lifespan. Black *et al.* (2006) argue that a focus on learning to learn and assessment for learning in schools is important *particularly* when it leads to the promotion of 'autonomous learning' or, as they prefer to say, 'intentional learning'. Intentional learning requires *a person to have an intention* and implies a sense of agency and choice.

Black *et al.* refuse to reduce learning to learn to either an individual quality or a set of strategies. They argue that it is impossible to separate learning to learn from the process of learning itself and they focus on the term 'learning practices' that incorporate intra- and inter-personal processes. Likewise, Bereiter and Scardamalia (1989) argue that intentional learning goes beyond simply the acquisition of study skills and strategies and requires practices which invoke the need for the learner to take responsibility for their own learning, and to do this in a way that involves peers. This requires students to be motivated to learn, and to be intentional, to be aware of themselves and others as learners, and to regulate their own learning.

A Finnish definition of learning to learn emphasizes the importance of agency and self-regulation thus:

The ability and willingness to adapt to novel tasks, activating one's commitment to thinking and the perspective of hope by means of maintaining one's cognitive and affective self-regulation in and of learning action. (Hautamäki *et al.*, 2002, p. 38)

Learning how to learn involves the person who is learning, and requires motivation, a sense of direction and desire, and a sense of agency and self-regulation. This implies a sense of time and direction: a person chooses a particular goal, or desired outcome which is achieved over time.

A journey metaphor

In a major review of forty-two frameworks for thinking and learning since the Second World War, Mosely *et al.* (2005) identified the key principles which were used in all of these frameworks. They include the *domain* of learning, the *content* of learning, including objectives and products, the *processes* of learning, which were characterized by sequencing, hierarchy, types of thinking or learning, complexity and quality, and *psychological aspects* which include the notion of stages, structural features of cognition, dispositions, consciousness, orchestration or control, internalization and degree of learner autonomy. This substantial work supports the development of a 'journey metaphor'. There is a person, with a sense of self, identity and intention, who has an objective or an outcome in mind, and who moves through a particular domain, engaging in particular inter- and intra-personal learning practices along the way.

Using the metaphor of 'learning as a journey' there are four 'stations' which require attention from learners and teachers. The first is the learning self, with its particular identity, nested sets of relationships, stories and aspirations. The second comprises the personal qualities, values, attitudes and dispositions for learning—perhaps twenty-first-century virtues. The third is publicly required and personally valued skills and competencies such as managing situations, being an active citizen or managing ambiguity (see, for example, Haste, 2001). The fourth is the acquisition of publicly assessed and valued knowledge and know-how. Learning and teaching require mentored, selective attention to be given to these stations in a spiral sequence rather than a linear one, since they are mutually reinforcing.

Learning power

It is the second 'station' in this metaphor which has to do with the personal power to learn, or its popular designation 'learning power'. This refers to seven core dimensions of the capacity to learn how to learn, which emerged from a factor analytic study with nearly two thousand learners (Deakin Crick *et al.*, 2004). It is described as 'a form of consciousness characterized by particular dispositions, values and attitudes, with a lateral and a temporal connectivity'. Significantly, the dimensions of learning power described in this study include affect, cognition, desire and action and thus cannot be reduced to only one of these components; hence the reference to dispositions, values and attitudes. Together these can be supported through the development of self-awareness and intentionality; hence the term 'consciousness'. Temporal connectivity refers to a 'way of being' in the world that orientates a person towards changing and learning over time and in different contexts, and lateral connectivity refers to the ideas embedded in a sociocultural view of

learning in which the learner is a ‘person in relation’ to other people and to cultural tools and artefacts, in which learning is frequently mediated through the interactions of learning relationships (Rogoff & Wertsch, 1984; Lave & Wenger, 1991). These may often be within a community of learners: a group of people committed to sharing learning in a purposeful and collaborative manner.

In relation to the ‘learning journey’, learning power reflects backwards to the learning self, since it is deeply personal, and forwards as mediated scaffolding, towards the development of competencies and the acquisition of knowledge and know-how. The purpose of making judgements about, or assessments of, someone’s learning power is to facilitate the movement between personal identity, choice and motivation and the processes and outcomes of learning. It is in this sense ‘dynamic’ since it is both retrospective (diagnostic and reflective) and prospective (formative and motivational).

Seven dimensions of learning power

The assessment tool is a self-report 72-item questionnaire which elicits information from the learner about how they report themselves on each of these dimensions at a particular point in time. The development of the questionnaire arose out of an exploratory factor analytic study with two thousand learners (Deakin Crick *et al.*, 2004). The item content of the original study derived from a substantial literature review about variables presumed to be relevant to learning how to learn. The study identified four broad categories, which appeared to be cumulative, discrete and interrelated dimensions of learning energy. They were:

- *learning capacities*: dispositions, awarenesses and skills;
- *learning identity*: the beliefs, values and attitudes about learning, self and knowledge held by the learner;
- *learning story*: the sociocultural formation of learners over time;
- *learning relationships*: the quality and substance of learning relationships.

The original project drew on a range of studies which identified variables which have an impact on the individual’s capacity and motivation to learn, such as self-esteem, locus of control, learning dispositions, goal orientations, learning styles and intrinsic versus extrinsic motivation (Deci & Ryan, 1985; Alsaker, 1989; Katzell & Thompson, 1990; Jonassen & Grabowski, 1993; Hattie *et al.*, 1996; Maines & Robinson, 1996; Dweck, 1999; Grimsell, 2001). It explicitly attempted to explore the *conglomerate of variables* as they might operate in persons in particular social contexts, and in particular trajectories in time. The resulting factor analysis identified seven dimensions of this ‘conglomerate’ which we described as ‘learning power’. It enabled the creation of an assessment tool which could provide feedback to learners, teachers and researchers about how individuals report themselves on these seven dimensions. The feedback to the learner is in the form of a spider diagram, in which each ‘leg’ reflects how much of a particular dimension the learner reported themselves to have

at that time and in that context. It carries no numbers, since these are not necessary for personal reflection and, in this domain, it is not precision which gives validity, but authenticity to the learner.

Changing and learning

Some learners appear to regard learning itself as learnable. They believe that, through effort, their minds can get bigger and stronger, just as their bodies can. They see learning as a lifelong process, and gain pleasure and self-esteem from expanding their ability to learn. Having to try is experienced positively: it's when you are trying that your 'learning muscles' are being exercised. Changing and learning include a sense of getting better at learning over time, and of growing, changing and adapting as a learner through the whole of life. There is a sense of history and hope. The opposite of changing and learning is being stuck and static. Other learners appear to believe that the ability to learn is fixed. They therefore experience difficulty negatively, as revealing their limitations. They are less likely to see challenging situations as opportunities to become a better learner.

Critical curiosity

Some learners manifest a desire to find things out. They like to get below the surface of things and try to find out what is going on. They value 'getting at the truth', and are more likely to adopt 'deep' rather than 'surface' learning strategies. They are less likely to accept what they are told uncritically, enjoy asking questions, and are more willing to reveal their questions and uncertainties in public. They like to come to their own conclusions about things, and are inclined to see knowledge as a product of human enquiry. They take ownership of their own learning and enjoy a challenge. The opposite pole is passivity. Passive learners are more likely to accept what they are told uncritically, and to believe that 'received wisdom' is necessarily true. They appear to be less thoughtful, and less likely to engage spontaneously in active speculation and exploratory kinds of discussion.

Meaning-making

Some learners are on the lookout for links between what they are learning and what they already know. They get pleasure from seeing how things 'fit together'. They like it when they can make sense of new things in terms of their own experience, and when they can see how learning relates to their own concerns. Their questions reflect this orientation towards coherence. They are interested in the big picture and how the new learning fits within it. They like to learn about what really matters to them. The opposite pole is fragmentation. Some learners are more likely to approach learning situations piecemeal, and to respond to them on their own individual merits. They may be more interested in knowing the criteria for successful performance than in looking for joined-up meanings and associations.

Dependence and fragility

Dependent and fragile learners are more easily disheartened when they get stuck or make mistakes. Their ability to persevere is lower, and they are likely to seek and prefer less challenging situations. They are dependent upon other people and external structures for their learning and for their sense of self-esteem. They are passive imbibers of knowledge, rather than active agents of their own learning. The opposite of dependence is resilience. Learners with these characteristics like a challenge, and are willing to 'give it a go' even when the outcome and the way to proceed are uncertain. They accept that learning is sometimes hard for everyone, and are not frightened of finding things difficult. They have a high level of 'stickability' and can readily recover from frustration. They are able to 'hang in' with learning even though they may, for a while, feel somewhat confused or even anxious. They do not mind making mistakes every so often, and can learn from them.

Creativity

Those learners who score highly on this dimension are able to look at things in different ways. They like playing with ideas and taking different perspectives, even when they do not quite know where their trains of thought are leading. They are receptive to hunches and inklings that bubble up into their minds, and make use of imagination, visual imagery, pictures and diagrams in their learning. They understand that learning often needs playfulness as well as purposeful, systematic thinking. The opposite pole is being rule bound. These learners tend to be less imaginative. They prefer clear-cut information and tried-and-tested ways of looking at things, and they feel safer when they know how they are meant to proceed. They function well in routine problem-solving situations, but are more at sea when greater creativity is required.

Relationships/interdependence

Learners who score highly on this dimension are good at managing the balance between being sociable and being private in their learning. They are not isolated, nor are they dependent. They like to learn with and from others, and to share their difficulties, when it is appropriate. They acknowledge that there are important other people in their lives who help them learn, though they may vary in who those people are, e.g. family, friends or teachers. They know the value of learning by watching and emulating other people, including their peers. They make use of others as resources, as partners and as sources of emotional support. They also know that effective learning may also require times of studying—or 'dreaming'—on their own. The opposite pole is dependence or isolation. Some learners are more likely to be stuck either in their over-dependency on others for reassurance or guidance; or in their lack of engagement with other people.

Strategic awareness

Some learners appear to be more sensitive to their own learning. They are interested in becoming more knowledgeable and more aware of themselves as learners. They like trying out different approaches to learning to see what happens. They are reflective and good at self-evaluation. They can judge how much time, or what resources, a learning task will require. They are able to talk about learning and about themselves as learners. They know how to repair their own emotional mood when they get frustrated or disappointed. They like being given responsibility for planning and organizing their own learning. The opposite of 'strategic' is robotic. Learners with these characteristics appear to be less self-aware, and are more likely to confuse *self-awareness* with *self-consciousness*.

Assessment for learning power

The ELLI learning profile is best described as a form of dynamic assessment with an interactionist orientation. That is, it is a form of assessment that focuses on 'modifiability and on producing suggestions for interactions that appear successful in facilitating improved learner performance' (Lidz, 1991) rather than on a static assessment of a learner's performance. The forms of intervention, which the learning power profile leads to, are interactionist in nature; they emerge creatively and intuitively from the interactions and relationship between learner and teacher, rather than from 'set responses' made by the teacher based on the psychometric properties of the assessment. They move beyond externally identified strategies for learning which will enhance student performance to an invitation to the learner to participate in the learning event, through becoming aware of themselves as learners and taking responsibility for their learning processes—in other words through becoming 'intentional' learners.

As Lantolf and Poehner put it, 'assessment and instruction are integrated as a means to move towards an always emergent (i.e. dynamic) future' (2004). This does not mean that the data produced by the tool cannot be used as a static measure—indeed for school-wide and systems-wide analyses ELLI profiles have much to offer as a self-evaluation tool. Rather, the Vygotskian philosophy from which this programme derives much of its intellectual parentage suggests that 'we must not measure the child, we must interpret the child' (Vygotsky, 1998) and thus the focus is on *self-evaluation of learning for learning*, using the profiles to 'encourage learners to interpret themselves' and to stimulate learner self-awareness, ownership and responsibility for what and how they learn.

Learning power profile forms of feedback

The following two figures give an example of the forms of feedback which are made available to (a) learners and (b) their teachers. The first spider diagram (Figure 1), 'Katie's learning profile', suggests someone who reports herself to be somewhat

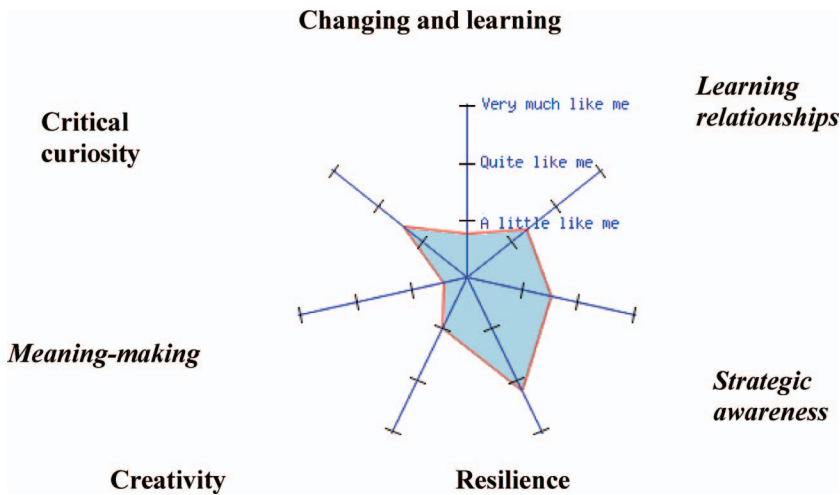


Figure 1. Learning profile for 'Katie'

resilient, disposed to keeping going and trying, as well as to some extent being able to be aware of what she is trying to do or learn. However, she is significantly lacking in a sense of herself as able to change and grow over time, and is passive in terms of the active dimensions of meaning-making, creativity and curiosity. She has more of a sense of 'teamwork' and positive learning relationships. The validity of this assessment is affirmed first by Katie herself and second by her teacher and other people who may know her well. The quality criteria are: Is it authentic? Is it trustworthy? Does it help us to move forwards? In development and research projects with nearly ten thousand learners, the face validity of these profiles, and their affordances in terms of language and self-reflection, have proved as important in practice as more precise measures of reliability and validity. Since teachers usually teach classes of children, the mean scores of a whole class on each dimension are also produced as 'pie charts' in traffic light colours of red, yellow and green, indicating the relative numbers of students who report themselves to have high levels of a dimension (green), low levels (red) and moderate levels (yellow) (Figure 2).

The class profile below suggests a class with relatively low levels of strategic awareness and the active learning dimensions of creativity, curiosity and meaning-making. However, they are more likely to exhibit positive relationships, a sense of changing and learning and resilience. In fact, this sort of profile is typical of a class being prepared for external, summative assessments—they are willing to receive and remember what they need to know to pass the test, and to work hard, but they generally lack the active learning strategies necessary to figure it out for themselves and, importantly, the awareness of their own learning practices. This information has proved important pedagogically in focusing teaching strategies in ways which promote ownership and engagement, and in developing a language for learning which can be shared and operationalized in the classroom.

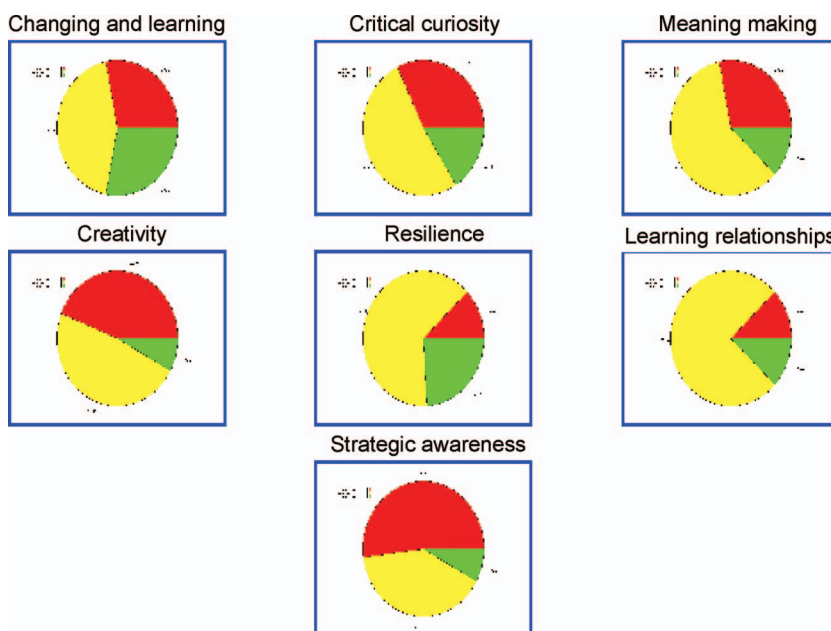


Figure 2. Mean learning profiles for a whole class $N = 28$

When assessment is dealing with the learning self, and the personal power to learn, the level of precision or the margin for error of the quantitative paradigm is not as important as qualitative interpretation, and the emancipatory use of language and identity. In building a bridge, or training an orthopaedic surgeon to replace a hip, such levels of precision would be crucial.

How do learners and teachers respond to this form of assessment data?

Since 2003 over nine thousand learners between the ages of 7 and 21 have used the learning power profiles in formal learning contexts, usually schools. One early qualitative research project was undertaken by the University of Bristol, and since then nine school-inspired development projects, seeking to address school self-evaluation questions, have developed these findings in practice. In this article I will report on the qualitative findings of the research project, and draw illustratively upon the findings and practices reported in the school projects.

The qualitative study reported here was undertaken as part of the wider empirical study through which the dimensions of learning power and the assessment tool were developed (Deakin Crick *et al.*, 2004). Teachers in the schools participating in the main study were invited to do classroom-based research to explore the application of learning power profiles to their classroom practices. It was thus a case-study which investigated the impact of learning profile assessment data on learning and teaching practices. Sixteen teachers in three schools were given learning profile data on their

classes, as individuals and the mean scores for their class as a whole. They then used that assessment data to devise learning and teaching strategies designed to strengthen their students on the dimensions of learning power.

The teachers and learners in this study came from three schools: A, B and C. A researcher worked with the teachers as a facilitator for the focus groups in which the learning interventions were recorded and analysed. School A was a primary school in a small rural town. Teachers and their classes from Year 3 to Year 6 participated ($n=251$). It already had a strong school culture that supported the process of learning itself, as well as achievement. School B was a comprehensive school located in an inner city. The sample within this school included teachers and their classes in Years 7 and 8, ages 11 to 14 ($n=79$) in science and English. School C was an independent school in the south-west ($n=50$). In this school, classes were small (approximately fifteen pupils in each class) and the subjects covered were language support, biology and English. The teachers ranged from experienced heads of departments to newly qualified teachers. Classes in Years 7, 9, 10, 11 and 13 participated.

Altogether 380 students (of mixed gender) and 12 teachers participated in the qualitative study. The students and the teachers were administered an early version, 55-item ELLI learning profile questionnaire at the beginning of the school year, in October 2001. The teachers devised their own learning interventions which were developed in response to the data provided in the learning profiles for their students, as individuals and as a group. The project was open-ended and exploratory. It was designed to enable teachers to 'interpret' their students for themselves and to respond creatively and dynamically, in keeping with the philosophy of dynamic assessment.

From October to May the teacher researchers then used that information dynamically in their teaching, and devised new strategies described as 'learning interventions' in their regular pedagogical practices. They were free to use the information in any way they chose, with a view to supporting their students in strengthening themselves as learners. The seven learning power dimensions were used as a framework for their work.

Qualitative data collection and analysis

The qualitative data collection and analysis focused on classroom practices in which both learners and teachers participated, rather than on student outcomes, and aimed to identify key themes through which the teachers understood their teaching and learning practices which they believed strengthened students' learning power.

The teachers in each school worked collaboratively, and met the researcher at regular intervals during the year. On average there were two teacher research meetings per term per school. In these meetings the researcher facilitated professional reflection and conceptual development. Teacher researchers brought their own written reflections and examples of pupil work and learning interventions to the

meetings. The groups used strategies such as brainstorming, force field analysis and the critical success factor process matrix from 'The quality toolkit' (Marsh, 1993) to facilitate creative thinking and analysis. After each research meeting the outcomes were fed back to the teachers for moderation, review and amendment in order to ensure that the outcomes were, as far as possible, reflecting the voice of the teachers. Evidence of pupils' work, including photographs, was collected to support the findings. In addition, the researcher observed each class on two occasions throughout the intervention period.

Findings

It was intended that the teachers would have a free rein to be creative and to improvise in providing appropriate forms of mediation in keeping with the Vygotskian philosophy informing the research (Newmann & Holzman, 1993). The teachers varied in their response to the feedback from the ELLI profile—each made their own judgement about how to use the data, whether to feed it back explicitly to individuals or to the class as a whole, or not to feed it back at all but to use it implicitly to inform their own learning and teaching strategies.

Thus each teacher and class response was idiosyncratic, and the first task in the analysis was to compile a list of strategies and activities from across the classrooms. The next task was to identify the underlying pedagogical theme for particular practices. For example, one activity was a 'learning jigsaw' for each student on the classroom wall, to which a piece was added each time students identified themselves as having progressed in a particular learning power dimension. The underlying theme was student self-assessment and ownership. Another response was tried by a science teacher who provided tasks which he knew his highly achieving students would fail at, in order to help them develop resilience. The underlying theme here was the development of student self-awareness and creating challenge.

Thus the analysis took place in three parts. First, teachers provided evidence of activities which they believed to be successful, in the form of actual student work, photographs, recorded conversations and narrative accounts. Second, they participated in identifying the underlying themes of their particular practices and in identifying the meta-themes from the sixteen classrooms as a whole. Finally, they completed a questionnaire at the end of the project.

The teachers confirmed a very significant degree of face validation of the ELLI learning profile data. They found that the ELLI profile on individual students was in keeping with their own perception and knowledge of their students. They recognized the 'personality' of their classes. For example, a class where there was a high degree of dependence and a low level of critical curiosity was reported to have a 'passive and manageable' climate. Another class which was known to be challenging, even for a highly experienced teacher, had an ELLI profile that showed that students in the class had a high level of critical curiosity, a high level of interdependence and a high level of creativity.

Key pedagogical themes

Teacher commitment to learner-centred values and willingness to make professional judgements

It became clear throughout the project that the assessment of learning power cannot be understood in isolation from the many variables that inform and shape the experience and interventions of teachers and learners in particular classrooms. The energy and vision of the teacher to engage with the ideas embedded in the learning profile was a critical success factor—and philosophically inseparable from the assessment process. Each learning profile for individuals and for class groups was different and thus invited a different response from each teacher, requiring teachers with both the capacity for professional judgement and the freedom to respond appropriately. The teachers themselves were the most important vehicles for development in their students of the seven dimensions of learning power.

Positive interpersonal relationships that are characterized by trust, affirmation and challenge

The most significant theme emerging from observation, teacher/researcher reflection and teacher qualitative reports was the centrality of the relationship between learner and teacher. Each teacher identified this as very important in the focus groups and in the questionnaire. Quality of relationships between people can only be validated by experience, and it is a product of who people are, as well as what they do, and is thus difficult to quantify other than through self-report. The relationships established, observed and described by the teachers in this study were relationships that were characterized by trust and affirmation and, significantly, by challenge. Bond (2004) defines trust as a relationship of such quality that both parties are confident that it can withstand the challenges of inequality, risk, uncertainty and difference. In order to learn something, the learner has to move beyond their 'comfort zone' and often has to face uncertainty and risk. Furthermore, the teacher often does know, where the learner does not, and this is an unequal balance. The characteristic of trust, or the confidence that these things can be faced and negotiated, and that the relationship will not break down through abuse or fragility, appears to be a critical thread in the ecology of a learner-centred environment. It could even be argued that where there is no risk, uncertainty or inequality, there is unlikely to be learning. While relationships of this quality were observed and reported, they were difficult to provide quantitative evidence for, thus making it a finding that could be readily overlooked. In fact, experientially, the teachers in the study described relationships as 'foundational' to building learning power.

As well as the quality of relationship between learner and teacher, the quality of positive learning relationships experienced by the learner both in class and in the home and the community was found to be a key theme. Listening to the learners' own stories, enabling them to tell their own stories either generally or in relation to the

learning task, seemed to be critical. This quality of the lived experience of the learner, and the capacity for that to be received and accepted in the learning community, by both teacher and learning colleagues, was a key theme that emerged in different ways again and again. Learning identity appeared to be developed in relationship to others—whether it was Year 13 biology students identifying their friend who knew how to make meaning, or the Year 4 student talking about ‘how his mum learns off him’, the relationships of learning seemed central.

Developing a language of learning, particularly through the use of metaphor

The development of a language of learning was something that the ELLI learning profiles both required and facilitated. Without a nuanced language to describe different aspects of learning it is difficult to name one’s own experience and thus become aware of oneself as a learner. There was a certain degree of ‘slippage’ in language that occurred as students took ownership of the ideas for themselves.

Every teacher in the study made use of learning metaphors with their classes. Lakoff and Johnson (1980) argue that metaphor is integral to understanding and that ‘metaphor is pervasive not only in everyday language but in thought and action’. They argue that metaphors are essentially understanding and experiencing one kind of thing in terms of another, and that metaphors profoundly shape our view of life in the present as well as setting up the expectations that determine what life will be for us in the future. The dimensions of learning power are not material entities but seem to be readily accessed through metaphor by very young children. For learners in this project metaphors for learning power provided a way of getting past cognitive blocks and engaging in creative and imaginative ways of viewing a subject. They appeared to open new possibilities in the minds of children, where talking about their learning in the conventional way had produced a poorer conversation and sometimes defensive or withdrawn responses. In these and later development projects, metaphors such as seven animals, or cartoon characters, would visually ‘carry the meanings’ of the seven dimensions in the classroom and, to some extent, decentre the teacher pedagogically. There was evidence of an emerging ‘iconography’ of learning summed up in this quote from a six year old: ‘Tortoise helped (Resilience) because my friends wanted me to race them. I kept on going even though I didn’t go slow and I won the race’ (Small & Burn, 2006).

Modelling and imitation

Modelling and imitation were used extensively as strategies for enabling learners to develop the dispositions, attitudes and values implicit in the learning dimensions. These strategies included modelling higher-order thinking, ways of managing feelings and problem-solving strategies. The science teacher would ‘think out loud’ in front of the class in order to demonstrate the way round a problem, and would model a ‘learner friendly’ way of coping with failure. A secondary English teacher in school B

would encourage weaker students to watch a stronger student do something, and then imitate it. In a primary classroom a conversation between the teacher and a learner, about learning processes, would be 'listened in on' by the rest of the class as a way of exemplifying some learning processes. Teachers would share their personal experiences and stories about learning, or they would use role play, and be honest and open about their own limitations.

Learning dialogue

The active promotion of learning dialogues was part of each teachers' response. For this they worked with the whole class, small groups, pairs and individuals. The dialogue was about learning power dimensions in relation to the learning purposes. In other words, the learning power dimensions functioned as scaffolding for the development of thinking and learning about the content of the curriculum. The attention moved between the 'learning self' and the 'content' or the 'text', touching on each 'station in the learning journey'. Dialogue is not just about the use of language, but includes a quality of relationship between speakers and listeners in which the 'others' voice is respected and heard. In other words there is a requirement to 'speak as a listener'.

Time for reflection

Reflection on the dimensions of learning became a key feature of each classroom. It was encouraged at the individual level, in pairs with learning buddies, in small groups and at whole-class level through 'circle time'. As the students reflected on their own learning and on the ways in which the class had changed and developed, so there was a growing sense of the ability to get better at learning. Spending time to attend to reflection in the classroom was not easy for the teachers and required actively prioritizing this over other demands.

Development of learner self-awareness and ownership

Developing students' self-awareness and ownership of their own learning processes, and taking responsibility for these, was a central purpose for all teacher interventions. This meant focusing on student self-assessment and, through reflection and dialogue, developing student-owned strategies and targets for change. In the secondary classrooms these strategies were more recognizable as forms of assessment for learning, whereas in the primary classrooms there were more creative and idiosyncratic responses. The key focus was on developing student self-awareness, ownership and responsibility for their own learning processes.

Providing students with choice and the responsibility for making choices

Each teacher in the project gave a degree of choice back to the students in relation to how and what they learned, so as to stimulate a sense of ownership of their own

learning. The choices varied from substantial ones—such as the choice of topic for study—to less significant choices such as the choice of partner or the strategy for problem-solving. With choice came greater student ownership of personal learning pathways and process.

Sequencing of learning materials—creating challenge through reorganizing the content of learning

A key theme across all the classrooms related to how the information or content of the curriculum was sequenced and framed. Sequencing and framing the curriculum particularly pertained to stimulating curiosity, creativity and meaning-making—the starting point would be students' 'lived' experience, personal interest and motivation. Teachers reorganized the ways in which they presented the material for a lesson, creating a situation where students were challenged to make sense of data and to make meaning from it. Teachers also explicitly related the content of lessons to students' experiences outside school and in the community, and they would 'scaffold' learning by inviting students to make connections with other aspects of the curriculum and with their wider life experiences. The sort of impact that such re-sequencing has is demonstrated by the words of this 10 year old: 'Sometimes we do literacy and science and I used to get completely mixed up. Now I see how they link up', and the following from a 16 year old: 'The project has helped me to use my critical curiosity to my advantage by researching something that interests me and I am curious about' (Small & Burn, 2006).

A toolkit of skills and strategies for learning how to learn

During the course of the qualitative project, and subsequently in the school-based development work, teachers were highly creative about the strategies and activities that they drew upon to support the development of 'learning power'. Some of these were drawn from national strategies and guidance, while others were more 'locally developed'. These tools and strategies were not new; rather, they were mobilized differently by the teachers in the service of developing learners' sense of identity, ownership and authorship of their learning pathway.

Discussion and conclusions

The dynamic assessment of students' learning power serves a number of pedagogical purposes. First, it reflects back to the learner what they say about themselves in relation to their personal power to learn. Second, it reflects back to the teacher data about individuals, and groups, which can be used for diagnosing what is needed to move forward in the development of self-awareness, ownership and responsibility for learning. Third, the dimensions of learning power provide scaffolding for the ways in which students encounter the formal content of the curriculum. All of these operate together through the shared, and sometimes locally created, language stimulated by

the learning dimensions, and through metaphors, icons and heroes which carry meaning in the classroom.

A sense of identity and ownership is crucial if students are to become intentional learners, taking responsibility for their own learning journey and making sense of the 'public funds of knowledge' which are their entitlement. Often knowledge is introduced to learners from the 'top down', acquired from a central fund. The dynamic assessment of learning power facilitates a 'bottom-up' learning journey which begins with the experience and choice of the learner. Identity is a troublesome concept, but being able to complete statements such as 'I am the sort of learner who usually . . . ' or 'I am the sort of learner who likes to . . . ' can be affirmations that build the self-knowledge and self-confidence necessary for a healthy identity. This sense of ownership is reflected in the words of one 16 year old: 'It's opened my eyes quite a bit to learn how to do these things. . . . And it's changed what I think I can do. . . . I didn't think I could learn any more but now I believe you can.' Through engaging with his own learning power and using it to guide him through a personalized project to an assessed outcome, this quote, which was part of his self-evaluation, demonstrates the confidence and identity he gained (Milner, 2006).

The learning journey is scaffolded towards a more personally owned construction of knowledge through dialogue, using learning power dimensions, in which attention moves between the person and the 'knowledge' to be acquired, in the context of experience. Simply put, the development of higher-order thinking, necessary for understanding, can be stimulated through critical curiosity or creativity. For example, one set of enterprising teachers developed a spider diagram in which the centre is blank, and seven legs represent the seven dimensions of learning power, together with their animal iconography. The diagram is on a place mat, and the student puts their own subject in the blank space in the middle. The subject could be an artefact or object of interest, or a science problem they want to solve, or a story they want to create. The learning power dimensions then scaffold their construction of knowledge, through reminding them of the questions they can ask. For example: What was here before? What else does this connect to? What do I already know about this? How can I solve this problem? Why am I stuck? What would happen if I listen to my imagination? Such strategies facilitate personal responsibility, as demonstrated by these quotes from primary school students: 'I am using my imagination a lot more' (6 year old) and 'I've become more curious; I think of things I need to learn' (11 year old) (Small & Burn, 2006).

The diagnostic purpose of the learning profiles has proved its usefulness in the studies described here and in the subsequent development projects. It is not the precision and numerical quantity of learning power that matters at this level, so much as the quality, authenticity and face validity of the profiles as they reflect back to learners and teachers what the learners already say about themselves, and stimulate purposeful learning. These voices of young learners provide authentic examples of the personal processes which can so often be invisible and yet which are emerging as crucial for learning in the post-mechanical age. In the words of a 17-year-old student, 'We're all programmed in a way that makes our experience invisible' and 'the

difference today being... achievement within yourself, rather than measured by someone else... self-growth' (Deakin Crick *et al.*, 2007).

The overwhelming implication of this work for policy-makers—at school or system level—is that assessment practices for learning how to learn must include the personal as well as the public; the affective and experiential as well as cognitive skills and strategies; and the learning relationships in communities of practice. At present both the curriculum and assessment arrangements tend to favour performativity—the public and summative, with validity and reliability criteria appropriate for quantitative public accountability. Bringing our education systems into balance with assessment practices and provision of curricula that foreground the personal and the formative, with appropriate quality criteria—such as authenticity and trustworthiness—is a pressing challenge for learning in the twenty-first century.

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